

**Exhibit B**

(19) The office of Patent Administration. (J P) (12) **Public Record of Patent (A)** (11) Patent number

[Translator's note: The Japanese text cannot be translated because it is part of the Patent number] 10-95481

(43) Publication Date: April 14, 1998

(51) Int.Cl.<sup>5</sup>

B 6 5 D 85/16

A 6 1 F 5/44

// A 6 1 F 13/15

[Recognition number]

F I

B 6 5 D 85/16

A 6 1 F 5/44 H

A 4 1 B 13/02 Z

Number of clause 5 OL (7 pages)

(21) Application number

[Translator's note: The Japanese text cannot be translated because it is part of the Patent number 8-248066]

(22) Application Date

September 19, 1996

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(54) [Name of invention] The packaging structure of disposable diapers.

(57) [Summary]

[Topic] It is compact, convenient to carry, easy to wear, and sanitary to dispose of. To offer a packaging structure of a disposable diaper that is compact, convenient to carry, easy to wear, and sanitarily disposed.

[Patent Details] A disposable diaper is packaged by using a packaging member. The packaging member (3) is a closed packaging bag (30) for sealing the diaper. The packaging bag is fabricated so that it maintains its shape and compresses the diaper to keep the thickness of the diaper. The advantage of the packaging structure is the compact size and that it keeps the diaper sanitary while facilitating the handling of a used diaper as well as the ease of carrying a folded diaper.

[Extent of Claimed Patent]

[Claim Clause 1] The disposable diaper is packaged by using a packaging material. The packaging material is a closed packaging bag for sealing the diaper. The packaging bag is fabricated to maintain its shape so that it compresses the diaper to keep the thickness of the diaper, and this is the advantage of the packaging structure of the disposable diaper.

[Claim Clause 2] The aforementioned disposable diaper is folded and wrapped which is characteristic as stated in Claim Clause 1 of the packaging structure of disposable diaper.

[Claim Clause 3] The aforementioned disposable diaper can be worn as underwear, which is characteristic as stated in Claim Clause 1.

[Claim Clause 4] The aforementioned disposable diaper features adhesive tape to dispose of a diaper, which is characteristic as stated in Claim Clause 1.

[Claim Clause 5] The manufacturing process of the referred disposable diaper is stated in Claim Clause 1. After using the packaging material to dispose of diaper, the disposed diaper

with its packaging material stays compact and dry. This advantage is part of the patent of the manufacturing process.

[0001] [The technology belongs to the inventor] This invention is useful for babies, adults, and the incontinent. The packaging structure is suitable for carrying a folded diaper. In more detail, the individual packaging structure of the disposable diaper is compact and sanitary while facilitating handling of a used diaper.

[0002] [The technology up to present and the issue which the invention tries to resolve] As a disposable diaper, there is a liner type which uses adhesive tape as closing method (called 'liner') and it has been the most often used type. Currently, a diaper that can be worn as underwear has two open sides; one for left and one for right leg and one open side for waist. It is widely used (called 'underwear type').

[0003] This type of disposable diaper is normally sold as a package with individual wrapping. There are many recommendations regarding the packaging method of disposable diapers. For example, regarding liner type diapers, there are three parts: back side, front side, and bottom. For each part different folding methods are recommend. On both the left and right sides, there is absorbent material with a side flap towards the top side which is to be folded. The advantage of this method is that the folds on the diaper correspond to folds on the person's body, thus making it easy to wear. Regarding the underwear type diaper in general, it cannot be folded. However, recent improvements make it compact and

therefore easy to carry or organized and noticeable when stacked. Several kinds of methods are recommended.

[0004] As the absorbent material of the disposable diaper, in general, biodegradable fiber pulp and high molecular absorbing polymer are used as the main materials. Biodegradable fiber pulp is easy to obtain at a cost-effective price, has high absorption ability and is usually used for manufacturing disposable diapers. However, instead of biodegradable fiber pulp, substituting synthetic fiber or mixed synthetic fiber and biodegradable fiber pulp is recommended.

[0005] The aforementioned absorbent material is determined by the amount of biodegradable fiber pulp and synthetic fiber. In general, the thickness of the disposable diaper depends on the amount of biodegradable fiber pulp and synthetic fiber. Even though all of the parts except the absorption material have been reduced, it is difficult to make the diaper thin. Therefore, the thickness of the disposable diaper depends on the amount of biodegradable fiber pulp and synthetic fiber which is used. If one piece of the disposable diaper becomes too thick, it creates problems. For example, the wearer looks awkward; the diaper becomes inconvenient to carry; and it takes up too much storage space. The desired outcome is to make the disposable diaper compact, while at the same time maintaining the function of the product.

[0006] It is preferable to reduce the thickness of the disposable diaper rather than reducing the amount of absorption material. However, there is a limit to reducing the thickness of the diaper

while maintaining the performance of the product. And it is suggested that the manufacturer reduce the thickness of the diaper rather than using the compression process in manufacturing the diaper [the compression process involves compressing the absorption material]. The compressed absorption material is elastic. If air enters the diaper after compression, it returns to the original, unwanted size. If compressed beyond the point of elasticity, the performance of the disposable diaper becomes extremely low because of the hardness of the diaper. For example, currently sold products are normally compressed when packed. When the product is removed from the package, the diaper returns to its original size. However, once removed from the package, its size makes it inconvenient to carry.

[0007] A used diaper in a trash can smells no matter how thoroughly it is wrapped. In terms of the underwear type of diaper, this is especially a problem. The diaper is very hard to wrap thoroughly.

[0008] In conclusion, after opening the disposable diaper package, the diaper becomes (1) inconvenient to wear, (2) inconvenient to carry. It becomes bulky and cannot be disposed in a sanitary way. In addition, these problems are exacerbated when carrying the diaper. Furthermore, it is simply more desirable to have a diaper without the aforementioned problems or packaging structure.

[0009] Therefore, the purpose of this invention is to offer a packaging structure of a disposable diaper that is compact, convenient to carry, easy to

wear, and easy to dispose in a sanitary manner.

[0010] [Patent Details] This invention is about the packaging structure of the disposable diaper. The aforementioned packaging material is a closed bag for sealing the diaper. The packaging bag is fabricated so that it maintains its shape and compresses the diaper to keep the thickness of the diaper, which is an advantage. The aforementioned purpose is achieved. The invention provides the following: the packaging structure of the disposable diaper which is folded and then wrapped; the packaging structure for the underwear type diaper; the packaging structure of the disposable diaper which has adhesive tape; the packaging structure of the disposable diaper which has a sealing process by which the wrapped diaper remains in the original position after wrapped, pressed, and sealed with wrapping material.

[0011] [Enforcement Form of Invention] The invention explains in detail the packaging structure of the disposable diaper using the following diagram. The diagram uses disposable diapers for babies as an example. Diagram 1 indicates the 3-dimensional drawing which is the first form of the invention: the packaging structure of disposable diaper. Diagram 2 indicates the 3-dimensional drawing of the disposable diaper in Diagram 1. Diagram 3 indicates the development drawing of the packaging material which is used to package the disposable diaper.

[0012] As Diagram 1 indicates the current form of the disposable diaper of the individual packaging structure 1, the disposable diaper 2 is wrapped with wrapping material 3.

[0013] Disposable diaper 2 in the aforementioned packaging structure of disposable diaper 1, as shown in Diagram 2, both sides of part 21, and the back side of part 22 are attached. On the underwear diaper, there is one opening for the waist, and a pair of openings for the legs. Each material [top sheet, back sheet, absorbing material, elastic material, etc.] is well known and not limited to use.

[0014] Wrapping material 3 in the aforementioned packaging structure of disposable diaper 1 as indicated in Diagram 3, is a rectangular sheet. Fold 31 is right between the two sides as stated in Diagram 1, the packaging structure of the disposable diaper. Polyethylene, polypropylene, nylon, vinyl chloride and plastic film are preferred for manufacturing the aforementioned sheet which composes of the aforementioned wrapping material 3. Specifically, polyethylene film is used for the original form of the product. And aforementioned wrapping material 3 is sealed by heat sealed edges 32, 33, 34.

[0015] Aforementioned wrapping material 3 composes the individual wrapping where the disposable diaper is sealed and packed. The aforementioned wrapping maintains its shape and compresses the diaper to keep the thickness of the diaper. Here the phrase, "maintains its shape and compresses the diaper to keep the thickness of the diaper," means that there is no additional pressure. The thickness becomes less compared to being outside the packaging.

[0016] In more detail, the aforementioned wrapping material 3, is folded as Diagram 3 indicates. Fold part

31 composes individual wrapping 30 which is sealed by edges 32, 33, and 34 as indicated in Diagram 1.

[0017] Also, aforementioned disposable diaper 2 is individually wrapped and packed by aforementioned packaging material 30. In this case, disposable diaper 2 is folded from bottom to top [collapse side part 21 and leg part 23 towards the inside of diaper], divided in the center, and vertically wrapped. And as stated in Diagram 1, the length of aforementioned packaging material 30  $L_1$  is twice as long as the length of folded disposable diaper 2  $L_2$  (vertical length). The used diaper can be returned to the package and wrapped for disposal.

[0018] Adhesive tape 35, which can be used in disposal, is attached in packaging material 3. Adhesive tape 35 is attached on the right center of bag 30, which is formed by packaging material 3.

[0019] Regarding the packaging structure of disposable diaper 1, the thickness ratio of disposable diaper 2 is desired to be within the range of 15-85%, and 40-60% is even better. If the thickness ratio becomes less than 15%, the diaper becomes hard and the texture worsens. And if the ratio exceeds 85%, the effect of preventing recovery decreases. Therefore, keeping the thickness ratio within the range is desirable. The definition of the aforementioned thickness ratio is calculated as follows: A number of disposable diapers which are manufactured by the packaging structure; would be opened and left under normal temperature, therefore there is no pressure and no moisture present; then their thickness is measured

and that is counted as 100. The thickness of the disposable diaper which is manufactured by this invention is measured as a percentage [as Diagram 1 indicates]. In addition, the aforementioned thickness is measured including absorption material which is located in the center of the product.

[0020] As Diagram 1 indicates, individual pack 30 is designed to have pre-cut notch 36 where edge 32 is pre-cut and easy to open. Regarding product form, as stated earlier, wrapping material 30 is manufactured in the same molecular direction as the sheet is manufactured; in one-way molecular lay-out direction. Pre-cut notch 36 is made in the same direction as the sheet is manufactured. According to this, opening individual pack 30 becomes easy, because it tears in the direction of the molecular lay out sheet.

[0021] The product form of individual package structure 1 is as follows. Tear the bag from pre-cut notch 36 and take out disposable diaper 2, and use. After using, take off the diaper, put it into the individual package 30, and use adhesive tape 35. The diaper then becomes disposable.

[0022] Due to the product form of the individual package as stated earlier, the elastic quality in the absorption material of disposable diaper is limited, and the two sided folded disposable diaper limits the recovery of the elasticity. Furthermore, when disposable diaper 2 under individual package structure 1 with no pressure stays inside package 30, the thickness does not recover to the original size. Following the above instructions seals the inside of the bag

and allows for sanitary disposal. Therefore it is convenient to discard.

[0023] Next, Diagram 4 explains the manufacturing method of the product form of individual package structure 1. Diagram 4 is the outline which indicates the manufacturing method of the product form of the individual package structure where the individual package structure is preferred for this invention of the disposable diaper.

[0024] In order to process the product form of the individual package structure 1, as Diagram 4 indicates, after packaging disposable diaper 2 using wrapping material 3, press disposable diaper 2 with wrapping material 3 and seal inside or release the air on purpose while at the same time keeping the fixed position of wrapping material 3 to be sealed and perform the sealing process effectively. In addition, except for the scaling process, there is no specific limitation on the manufacturing process of disposable diaper 2 in general.

[0025] In more detail, aforementioned sealing process is done as follows. Put disposable diaper 2 in the middle of the two sided divided wrapping material 3 with center crease 31. Release the air inside of wrapping material 3 and disposable diaper 2 with pressure using press roll or press conveyor belt in the direction of the arrow on Diagram 4. At the same time, seal edges 32, 33, and 34 of wrapping material 3. This is how individual package 30 is formed. Furthermore, make pre-cut notch 36 with the usual method and attach adhesive tape 35. As Diagram 1 indicates, the first form of packaging structure 1 can be made. The definition of aforementioned fixed position which is sealed means the



unsealed surrounding part which is edges 32, 33, and 34 excluding crease 31 in the product form.

[0026] As for the material of the aforementioned press roll or press conveyor belt, it can be constructed from iron, rubber, foam rubber, plastic, etc. which are well-known materials. For example, in order to get a hard pressed individually wrapped product, use the method which produces a gap clearance of 0.5mm with line pressure between 10-20kg f/cm pressing with iron roll.

[0027] The form of folding diaper is not limited as Diagram 1 indicates. It is acceptable to double fold towards the inside of the diaper where the side flap, part 24, where non-absorption material is not present as well as in side part 21 and back part 22. In addition, as Diagram 6 indicates, it is acceptable to fold to appear like a w-shape in section.

[0028] In addition, in this invention of the packaging structure of disposable diapers, as Diagram 7 indicates, so to speak, unfolding of the linear type diaper is applied. It means the well-known unfolding linear type diaper can be used where absorbent material is placed between both top sheet and back sheet and elastic material is placed surrounding each waist part and leg part. In this case, as Diagram 7 indicates, regarding the folding or unfolding liner type diaper 2A, it is desirable to fold the side flap part 24A towards the top sheet side and it becomes almost a C-shape with 3 layers after folding. And as Diagram 8 indicates, it is desirable to form the individual packaging structure 1A in the same way as the first formation of the individual packaging structure which means that the 3 layer

folded liner type diaper is put inside the individual package 30A.

[0029] Unfolding liner type diaper 2A which is unwrapped individually with no loading recovers elasticity of absorbent material or recovers elasticity of materials from collapse due to the shrinking of elastic materials which are recovering elasticity of absorbent material and recovering elasticity of materials in general. However, in product form of individual packaging structure 1A compactness doesn't recover. This three layer unfolding liner type diaper is opened and used, is designed in leg part using elastic material, it curves around the top sheet and becomes oval shaped. Due to this, it becomes easy to wear, and easy to carry.

[0030] The next explains the other form of this invention of the individual packaging structure using Diagrams 9 and 10. Further explanation of the especially different fact of the first form is as follows. It would be applied to the aforementioned first form if especially not mentioned. Diagram 9 is a 3-dimensional drawing which indicates the second form of the disposable diaper, this invention of individual packaging structure. Diagram 10 is a 3-dimensional drawing which indicates the third form of the disposable diaper, this invention of individual packaging structure.

[0031] Regarding the second form which is indicated by Diagram 9, the size of individual package 30 is different from the aforementioned first form. As Diagram 9 indicates, regarding product form of individual packaging structure 1, the length of aforementioned individual package 30 L<sub>1</sub> is the same as the length of the two sided folded disposable diaper

L<sub>2</sub>. In addition, pre-cut notch 36 is designed on the edge of 34.

[0032] Regarding the third form indicated in Diagram 10, form (sealed form) of individual bag 30 is different from the aforementioned first form. It means, as Diagram 10 indicates, the product form of individual packaging structure 1, individual bag 30 becomes the individual bag form of with a pillow shape. Both front and back side edges 32, and 33 and one side of center part 34 are sealed. Like this, it is not especially limited in the sealed position of wrapping material 3 (in other words, sealed form of individual bag 30). Regarding aforementioned second to fifth forms, the same effect of aforementioned first form is expected.

[0033] Here, this invention is not limited to the aforementioned form, but can be changed in a variety of ways within the scope of the invention. For example, instead of placing aforementioned notch 36, sewing machine stitches and the like can be placed, and by adding a string, etc. used for opening the individual bag, it makes it easy to open. Here, in those cases, it is preferable that when opening the individual bag it should not tear in pieces which become garbage. Furthermore, there are several methods for re-sealing the individual packaging bag for disposal. By placing aforementioned adhesive tape 35 or adding a string or pre-coating with glue, etc., the bag can be a size at which the bag can be bundled by itself, thus, it can be designed so that it is possible to seal the bag for disposal. Moreover, sealing of individual packaging bag 30 is not done by heat sealing, but can be done by welding such as impulse sealing, ultrasonic sealing or high frequency

sealing, or by sealing with an adhesive tape or pressure bonding. In addition, at the time of manufacturing of the individual packaging structure 1 of the present invention, instead of applying aforementioned pressure in order to release the air from the individual packaging bag, sealing may be done after suctioning the air from the individual packaging bag by using a suction pump, etc. That is, instead of using the compression and sealing processes of aforementioned preferable manufacturing method, it is possible to manufacture the individual packaging structure of the present invention by removing air and sealing processes wherein sealing is done at predetermined places after the air is suctioned from the individual packaging.

[0034] [Performed Experiment] This invention is not limited to only the following performed experiment and control experiment, although the details about the performed experiment of this invention and control experiment will be explained.

[0035] [Performed Experiment 1], Polyethylene film is used as wrapping material. A number of underwear type disposable diapers which are removed from the normal compressed wrapping product which is wrapped with normal pressure are used as a disposable diaper in this performed experiment. Then the disposable diaper which is removed from the compressed wrapping product is immediately placed inside the wrapping material with a pressure of 5kg f per piece and the air inside the wrapping material is released and the edge of each wrapping material is heat sealed [as the sealing process]. Fold diaper with two sides and wrap

individually. As Diagram 1 indicates, the formation of an individual packaging structure is formed. In addition, put the disposable diaper (which is folded) inside the individual bag which is made of wrapping material and put the acrylic board on top of the individual bag and then add weight on top of it. This is how the pressing process is done. Regarding the performed individual packaging structure, research was done in order to examine the change of thickness under preserving conditions which is normal temperature and normal moisture. Graph 11 indicates the result. The thickness was measured using a dual gauge (product of Mitsutoyo code No. 575-113) and stand (product of Mitsutoyo code No. 7002). (n=10)

[0036] [Performed Experiment 2] Except for the pressure weight which was 15kg f per piece, the change of thickness was measured under the same conditions as performed in experiment 1. Graph 11 indicates the result.

[0037] [Performed Experiment 3] Except for the pressure weight which was 25kg f per piece, the change of thickness was measured under the same conditions as performed in experiment 1. Graph 11 indicates the result.

[0038] [Control Experiment 1] Except not using individual packaging structure, in other words, only using the diaper, the change of thickness was measured under the same conditions as performed in experiment 1. Graph 11 indicates the result.

[0039] As Graph 11 indicates, obviously each aforementioned thickness ratio is as follows: performed experiment 1 is 70%; performed experiment 2 is 60%;

performed experiment 3 is 55%. There was no change of thickness after seven days passed regarding the wrapping structure of performed experiments 1 through 3.

[0040] [The effect of invention] This invention of the individual packaging structure of the disposable diaper enables it to be compact, convenient to carry, easy to wear, and disposable in a sanitary way.

[0041] In detail, (1) the inside of the individual bag is cut off from the air; there is no air which is needed to recover the thickness of the absorption material. Until the individual bag is opened, the absorption material does not increase the fixed thickness of the absorption material. Furthermore, this invention of the individual packaging structure stays un-pressured, compact and convenient to carry, easy to wear, and easy to be put on [Translator's note: by someone such as a nurse]. (2) Because the used disposable diaper is placed inside of the opened individual bag, there is no smell and it can be disposed in a sanitary way. (3) Furthermore, the individual wrapping enables it to be stored in an extreme sanitary way, discarded in sanitary way, and prevents deterioration of product performance and prevents color change after a certain amount of time due to air exposure.

[Simple explanations of diagrams]

[Diagram 1] Diagram 1 shows a 3-dimensional drawing which indicates the first form of this invention of the individual packaging structure for the disposable diaper.

[Diagram 2] Diagram 2 shows a 3-dimensional drawing which indicates the

disposable diaper which is used in the individual packaging structure.

[Diagram 3] Diagram 3 shows the unfolded wrapping material which is used in the individual packaging structure.

[Diagram 4] Diagram 4 is an outline which indicates the manufacturing method of this invention of the individual packaging structure for the disposable diaper.

[Diagram 5] Diagram 5 is a 3-dimensional drawing which indicates the other example of folding the disposable diaper by the first form.

[Diagram 6] Diagram 6 is a 3-dimensional drawing which indicates one example of the folded form of the disposable diaper under the first form.

[Diagram 7] Diagram 7 is a 3-dimensional drawing which indicated the other example of the disposable diaper which is used in the first form.

[Diagram 8] Diagram 8 is a 3-dimensional drawing which indicates the individual packaging structure of this invention of the disposable diaper under the first form.

[Diagram 9] Diagram 9 is a 3-dimensional drawing which indicates the second form of this invention of the individual packaging structure for the disposable diaper.

[Diagram 10] Diagram 10 is a 3-dimensional drawing which indicates the third form of this invention of the disposable diaper of the individual packaging structure.

[Graph 11] Graph 11 is a graph which indicates the results of the performed experiment and control experiment.

[Explanation of numbers]

1. Individual packaging structure
2. Disposable diaper
21. Side part
22. Back part
23. Leg part
24. Side flap part
3. Wrapping material
30. Individual bag
31. Crease
32. Edge
33. Edge
34. Edge
35. Adhesive tape
36. Pre-cut notch

Diagrams 1-10

Graph 11 Information:

(Y-axis) The thickness of two-sided folded diapers (mm).  
Beginning 0 5 10 15 20 25

(X-axis) Time lapsed (days)  
Beginning 1 2 3 4 5 6 7

Graph Key information:

- Control experiment 1
- Performed experiment 1
- Performed experiment 2
- Performed experiment 3